



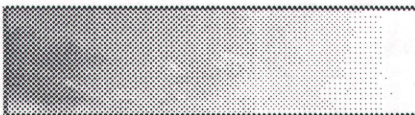
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A Novel Approach To Prevention of Acid Rock Drainage (ARD)

EPA Contract Number: 68D00276**Title:** A Novel Approach To Prevention of Acid Rock Drainage (ARD)**Investigators:** Olson, Gregory J.**Small Business:** Little Bear Laboratories Inc.**EPA Contact:** Manager, SBIR Program**Phase:** II**Project Period:** September 1, 2000 through September 1, 2002**Project Amount:** \$224,941**RFA:** SBIR - Phase II (2000)**Research Category:** SBIR - Water

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Description:

The generation of acid rock drainage (ARD) is the most serious long-term economic and environmental issue facing the mining industry in the United States today. ARD also is an international problem of the highest priority for the mining industry. ARD is associated with the mining of coal, copper, other base metals, and precious metals. ARD is caused by the exposure and weathering of sulfide rock, chiefly the oxidation of pyrite (iron disulfide) in rocks and ores. The ARD process releases acid and heavy metals into receiving streams and groundwater. Certain acid-loving (acidophilic) bacteria are known to accelerate the oxidation of pyrite 10- to 20-fold or more over the background chemical oxidation rate. Consequently, stopping the activity of these organisms has been viewed as key to combating ARD. Existing technology for inhibiting these bacteria in active and abandoned mines has met with limited success and is not widely used. This proposal describes the development of a new technology for stopping the activity of sulfide-oxidizing bacteria in mining wastes. This approach uses a biocide that is highly and selectively toxic to sulfide-oxidizing bacteria at extremely low concentrations. The Phase I research employed three sources of sulfide rock from U.S. mines. Small-scale, short-term accelerated weathering tests showed the biocide could prevent formation of biocatalyzed ARD and also could stop active biocatalyzed production of ARD. The biocide is relatively nontoxic to other forms of life and is not listed on aquatic toxicity or human health standards. The biocide is stable in acidic environments where sulfide oxidizing bacteria grow, but is readily biodegraded under normal environmental conditions.

A Phase II research objective is to demonstrate the effectiveness of the biocide in longer-term, larger-scale columns containing waste rock. These tests will establish the biocide dose, method(s) of application, and time period of effectiveness. These results will be used to produce engineering specifications for a field trial. Another

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objective in Phase II is to produce and evaluate the effectiveness of slow release forms of the biocide.

The results of Phase II will: (1) demonstrate to potential clients the feasibility of using the biocide, (2) identify the options for applying the biocide to prevent or stop ongoing ARD, (3) provide expected performance criteria (dose, frequency) for field trials, and (4) provide prototype slow release product(s).

Several major hard rock mining companies have expressed strong interest in the research and some have pledged funds to augment the project. The proposed Phase II option will involve a pilot field trial of the technology, beginning during the second part of the Phase II research. A successful field demonstration is an important step in commercialization of the technology.

Supplemental Keywords:

small business, SBIR, wastewater treatment, engineering, chemistry, EPA. , Ecosystem Protection/Environmental Exposure & Risk, RFA, Scientific Discipline, Toxics, Waste, Water, Chemical Engineering, Chemical Mixtures - Environmental Exposure & Risk, Chemistry, Chemistry and Materials Science, Ecological Effects - Environmental Exposure & Risk, Ecological Effects - Human Health, Ecological Indicators, Ecosystem Protection, Ecosystem/Assessment/Indicators, Engineering, Chemistry, & Physics, Environmental Chemistry, Environmental Engineering, Fate & Transport, Hazardous, Hazardous Waste, National Recommended Water Quality, Wastewater, exploratory research environmental biology, ARD, acid mine drainage, acid rock drainage, copper, industrial wastewater, mining, mining wastes, municipal wastewater, sulfide

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